



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE
AMERICAN NATURALIST.

Vol. VII. — MAY, 1873. — No. 5.



THE WINTER STATE OF OUR DUCKWEEDS.

BY PROF. T. D. BISCOE.



IN the autumn of 1871, I brought home a bottle full of duckweed (*Lemna polyrrhiza*) and emptied it into a tumbler of water with a mass of algæ gathered at the same time.

Within a few days the *Lemnæ* all turned white and died, and the fronds seemed to decay. I kept the algæ in the tumbler all winter, adding fresh water as fast as it was diminished by evaporation: I saw no more of the duckweed till the last of the winter, when one day, to my great surprise, there appeared floating on the water a group of fronds that were certainly *Lemnæ*, and a few days after I noticed another frond. What had they grown from? I turned out the water into a basin and found about fifty little disks which seemed to answer the description of autumnal or winter fronds as described in my "Gray."

My curiosity was excited. How could such things grow into *Lemnæ*? Where was the growing point? Where were the roots to start from? What was the internal structure of these regular little disks? Should I find anything corresponding to buds about them?

Some of these queries I have answered and others are still unsolved.

I propose to give a short account of my failures and successes, and of the methods of investigation by which I tried to reach the knowledge sought; and hope that my trials may be of service to

Entered, according to Act of Congress, in the year 1873, by the PEABODY ACADEMY OF SCIENCE, in the Office of the Librarian of Congress at Washington.

some who often desire to make additions to the store of botanical morphology but who hardly know how to proceed.

It is best to select some definite question concerning the case that one wants to study, and then with knife, needles, chemicals and microscope, compel it to yield an answer. It will give definiteness and precision to one's work. I started with this one: "Where is the growing-point of this winter frond?"

By Figs. 1 and 2, it will be seen that the object is almost exactly of the shape of a shallow plano-convex lens, the flat side being the upper side; as I found some weeks after, when they rose and floated on the surface of the water.

The outline is often slightly kidney-shaped, and at the sinus there is a scar on the edge, Fig. 2s. Sections show that the edge is here more obtuse than elsewhere.

Around that point, on the flat surface, there was traced a small semicircle. That was all that could be described on the exterior. The disk was not at all transparent, so that all knowledge of its interior must be obtained by dissection.

Laying the frond on the end of the forefinger, and holding it in place by a gentle pressure of the thumb, I made three or four slices lengthwise (that is in the direction of the lines *a-a*, *b-b*, etc., of Fig. 2). From the tip three-quarters of the way to the base (as I shall call the scar end) all these sections were composed of simple parenchymous tissue (where cells are of nearly equal dimensions in all directions), whose cells were packed with starch grains. But the quarter next to the base presented very different views in the several sections, and appeared quite complex (Fig. 53). Two regions, Fig. 4 *a* and *b*, attracted attention because of the fineness of the

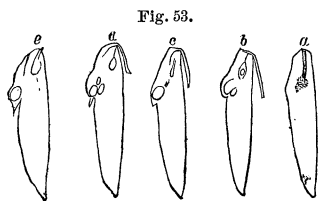


Fig. 53.

tissue composing them. The cells in these parts were not more than an eighth the diameter of the regular cells of the frond; neither were they filled with starch grains; but were well supplied with protoplasm, with considerable chlorophyl.

Here evidently was the place to search for my "growing-point." In that one of these regions furthest from the base, Fig. 4 *a*, and on the convex or under side of the frond, are one, two, or more oval bodies whose axes of growth were nearly at right angles to the length of the frond. I took them for young buds. In each section

one was larger than the rest. I took it for the main bud, and supposed that its extremity was the growing point of the plant. To get a better view of its tip, that I might make out the plan of cell-division at the point where the cells were first formed, I made some new sections in the same direction, much thinner than the first. On examining these I recognized the cell arrangement peculiar to the extremity of roots; there plainly enough was the root-cap, Fig. 4 *d*, and the "summit" cells or region, Fig. 4 *c*, where by cell-division the new growth is produced. These were surely the rudiments of young roots. I must look elsewhere for the plumule with its growing point. But one thing had been learned; my little disk contained roots, and I knew where they were.

The other spot where the cells were small and tinged with green seemed without any regular shape. One section showed one thing, another quite a different thing; while in another there would be nothing but a hole where the fine cells ought to be.

See the differences in the five sections of Fig. 53. These sections were made through the lines marked *a-a*, *b-b*, etc., of Fig. 2.

As the next step I made some sections at right angles to the former in the directions *A-A*, *B-B*, etc., of Fig. 2 (see Fig. 5), and got one new idea at least. Instead of there being one body in the place occupied by "*b*," Fig. 4, there were two, one on either side of the median line of the frond, and the two were very unequal in size, though somewhat similar in form. But, although diligently comparing the views presented by the two sets of sections, I could not form any satisfactory idea of these portions. The two sections *D* and *E*, of Fig. 5, showed quite clearly the number and position of the young roots. The darker spot which appeared in the last three sections, marked "*s*" in "*D*," Fig. 5, was a new mystery. I must have sections in the third plane also, that is, the plane passing parallel with the surface of the frond.

And just here let me say a word about making sections of delicate vegetable tissue. I have found it much better in all cases, except where the position and structure of the protoplasm are in question, to soak the specimens in glycerine, first in diluted and finally in strong. One advantage is this; when making sections of soft tissues in water, there is great danger that a thin section on the blade of the razor will dry up and be spoiled, while attending to the piece on one's finger, which ought to be taken off immediately and laid in water. Or if one first cares for the section on the

razor, then the piece from which it is cut may be spoiled. But when the object is in glycerine, plenty of time can be taken to care for both without any injury coming to either. I have found a good razor the very best thing to cut with, much better than any lancet or small dissecting knife.

Let the thumb-nail of the left hand be cut short enough that the blade of the razor may rest against the flesh of the end of the thumb, while the object to be cut rests on the forefinger and is held in place by the thumb. You can then draw the razor very evenly, it being steadied by the thumb. The thickness of the slice can be regulated by pressing the razor less or more against the yielding flesh of the thumb. Especially is this the case when several sections are made one after the other by as many drawings of the razor, each time pressing it a little more against the thumb-end. In this style of cutting, the hand should be so held that the surface of the forefinger, on which the object is laid, should be horizontal; but when a thin object is to be split parallel with its surface, I have found it best to turn the hand, after the object has been placed, as before, between the forefinger and thumb, so that the surface of the finger on which the object is lying should be vertical: you see then the edge of the object to be split. The edge of the razor must, of course, be also a vertical line. It is essential, in this case, that the object be placed far enough back from the ends of the finger and thumb that the razor blade may come between them and be guided and steadied by its contact with them.

Having brought the edge of the razor in contact with the object to be split, draw the razor downward, bringing at the same time the heel outward (towards the right) and the point inward, making the part resting between the thumb and finger the centre of this slight rotation.

During this operation I have found it best so to hold the hands and head that the eye sights right down the edge of the vertically held razor, for then the razor edge can be placed very truly against the exact portion of the object to be split that you desire.

Resuming now our investigation of the duckweed;—I sliced the frond into three or four sections parallel with its surface, and, placing them under the microscope, order seemed to be emerging out of chaos. To the right and left of the middle line of the frond were two cavities, one of them almost filled with one of the small celled bodies, Fig. 6 *rb*, while the other was not more than one-

third filled, Fig. 6 *lb*. The middle line, Fig. 6 *st*, was distinguished from the rest of the frond by the shape of the cells composing it, and also by the fact that they were empty. At one end was the scar, Fig. 6 *sc*, and at the other a snarl of cells out of which radiated five or six veins or ribs, Fig. 6 *v*, consisting of woody fibre with spiral cells; besides, there was a single line of spiral cells turning back into each of the two small-celled bodies. This centre of radiation was what I had seen in the sections of Fig. 5, marked “*s*.” This middle portion is the stem of the frond, and the scar marks the place where it separated from its parent frond.

I began then to understand the other appearances; these were the young buds by which *Lemna* propagates itself independently of seeds. Each one of these would grow into a complete individual, and in it I must look for the “growing-point.”

The cavity in which the larger bud grew seemed of a rectangular form, with rounded corners from the lower of which the bud stalk started: the bud itself partook somewhat of the same rectangular shape, instead of being circular, as most of the fronds were.

The young bud on the right, though as yet without any ribs of woody fibre, showed plainly where they were to be, for in the lines that they were to occupy the cells were compact, with no intercellular spaces, while in the rest of the bud between these rudimentary ribs the cells had parted at the corners and produced air spaces, small indeed, but yet sufficient to give a marked character to that portion of the tissue. The part next to the stem of the bud was, like the ribs, without intercellular spaces.

The axes of the frond and buds are at an angle with each other of about 45° , or more correctly 135° , since the normal position of a branch is in nearly the same direction as the stem, and its divergence should be measured round from that direction as its starting point. With our plant the line of growth seems to be backward. If the same law holds in regard to the buds of the next generation then they must be sought near the stem and with their axes inclined at the same angle. (See the diagram, Fig. 9, where the vertical line represents the axis of the frond, and the different oblique lines the axes of the buds.)

A little examination showed that it was so, and that on each side of the axis of the bud, and near the base, was a little protuberance which was evidently a bud of the next generation. But, though they were there, it was by no means so clear what their form might

be, or how far they had advanced in laying the rudiments of the organs possessed by the mature frond. Here began the difficulties of the investigation. My desire was to trace back the frond to the stage in which it was represented by a single cell, or at least by a small group of homogeneous cells, on which there was no sign of any organ; and then to be able to see both where and in what shape each new part was produced by changes in the growing point and the tissue adjacent thereto.

Of the two budlets, the one on the left, next to the main stem, was the most developed, and I studied it, rather than the other. Figs. 6 and 14 present the views obtained when the razor just grazes the upper surface of the buds. Near the upper edge of the bud was a most delicate line, Fig. 6 *m*, which could hardly be traced with a $\frac{1}{4}$ inch objective. A $\frac{1}{8}$ objective and $\frac{1}{16}$ objective showed that it was the edge of a membrane consisting only of one layer of cells in thickness. The cells, Fig. 55, were irregularly shaped and had crinkled walls. I could follow the line most to the edges of the bud, but not quite. The budlet, Fig. 14, was, like the bud, of a rectangular outline nearly, and grew out from the corner of its cavity. I could make out the following particulars; "*a*" a fine curved line which it took close observation to see at all; "*d*" a double line at the back of the budlet; "*c*" and "*e*" two swellings of the outline of the budlet "*b*;" "*f*" an edge of tissue two cells thick coming to a point where it reached the frond at "*i*;" "*h*" the least developed budlet; and "*g*" a small protuberance of cells, which I have not thoroughly studied and shall therefore be obliged to omit in my descriptions. What it may grow into, if it grow at all, I cannot say.

Horizontal sections had helped greatly, but vertical sections seemed now to offer the only hope of increasing my knowledge of the bud and budlet. After making many, I was no better off, because it was impossible to tell exactly in what direction, as regards the axis of the bud, the sections went. I then split a frond through so as to reveal the upper surface of the bud without touching it with the razor or loosening it from its attachment.

Then with the camera I sketched its outline as seen with a $\frac{1}{4}$ and was then ready for the delicate work of slicing it up. (Fig. 7 gives such an outline.) Taking the frond on the forefinger I cut one section as nearly as possible in the direction which I had decided would give a longitudinal section of the bud, as Fig. 7 *e-e*.

As soon as the cut was made the piece taken off was laid on a slide in a drop of glycerine, and the slide numbered "No 1." Next the frond, from which the cut had been made, was put under the microscope and the direction and position of the cut observed and its place recorded on the camera drawing, and numbered "1." The frond was then laid on the finger and the second cut made, as thin as possible, and as near parallel to the first as might be. I could not succeed in getting the series of cuts as nearly parallel to one another in this way, as by cutting all the sections at once without removing the razor from its rest against the end of my thumb. But generally the deviations from parallelism were not so great as to interfere seriously with the usefulness of the sections, considered as a set.

After each cut, the section was placed on its separate slide and numbered and the remainder of the frond placed under the microscope and the position of the cut marked. In this way I sometimes got a series of fifteen or twenty sections, extending from one edge of the bud to the other. Of these from three to five would pass through the budlet.

Next was the study of these sections one after the other in order, comparing them with each other, and with the surface view of an uncut bud, attempting to construct mentally the complete form of which the microscope gave me successive sectional views. I had had before just as good sections, in some cases better ones, but then could not tell from what part they came and so had been unable to form a connected satisfactory idea, or model, of the whole. One such set shed light in a given direction, but others were needed. Some eight sets of vertical sections in various directions gave all that could be expected of them, and yet the matter was not quite clear. I wanted the budlet sliced in a direction parallel with its surface. The plane of the bud is not quite parallel with that of the frond, so that I could not get just the right sections by the method of splitting the frond between the thumb and forefinger. I could imbed a frond in a mixture of gum and glycerine; but that took so long to harden that, if several fronds were prepared for cutting, I was very apt to forget just where the cut should be made in each, and so run the risk of spoiling the specimen. Something was wanted that would set and harden in a few minutes. I thought of collodion, and on trial it proved to be just what was wanted. When the specimens are saturated with glycerine, and

placed on the end of a little stick of pith, I drop a single drop of collodion over them, which hardens in about two minutes, and without sticking to the specimen makes a complete socket for it. From fronds mounted in this way I succeeded in getting sections so thin that it took three of them to make up the thickness of the budlet.

In order to test the correctness of the opinions formed from the comparison of these different sectional views, I wanted next to dissect out a budlet free from the bud, and in an uninjured state, and turn it over and over while in the field of view of the microscope. I have accustomed myself to the use of dissecting needles under the compound microscope without the help of an erector, and so was able to have the advantage which the binocular gives for such work.

I should advise, from my experience, that any one using a binocular, who has much occasion for dissecting, should learn to handle the needles under the microscope without an erector. It is not difficult to train one hand, though when it comes to using both I acknowledge that one will need a good stock of patience.

The powers used for this work were 80 and 115 diameters. The needles found most useful were those which had been ground with an exceedingly slender taper and the shortest possible piece of the tip bent at an angle of about 45° .

The budlet when obtained free measured about $\frac{3}{1000}$ of an inch in length and half that in breadth and thickness. To observe it to advantage one must use powers of $\frac{1}{4}$ and upwards.

Having placed it in a drop of glycerine, cover with a rather large cover, and let there be enough of the fluid to prevent the cover's pressing it on the slide; then with a needle gently push the cover in one direction or another till you have your object rolling over and over fast or slow just as desired.

Now let us gather up the facts we have obtained by the methods described. Figs. 10, 11, 12, and 13, give specimen sections taken in as many different directions through the bud as shown on the plan, Fig. 7.

The dotted lines in the bud of Fig. 7, show what would be seen when the lower surface of the bud is focussed instead of the upper. I drew them in the same figure in order that their relation to the upper surface might be plainer than if I had given them a separate drawing. In Fig. 10, we have a section passing parallel with the

stem of the bud, but a little to the left. It crosses both the lines in the upper part of the frond, it goes through one of the dotted oval bodies, and also through the budlet to the left of its stem. The section shows that those lines on the upper part of the bud, Fig. 7 *um*, and *lm*, one above and one below, are the edges of two membranes that nearly enclose the bud between them, the one on the upper surface only one layer of cells, the lower several layers thick.

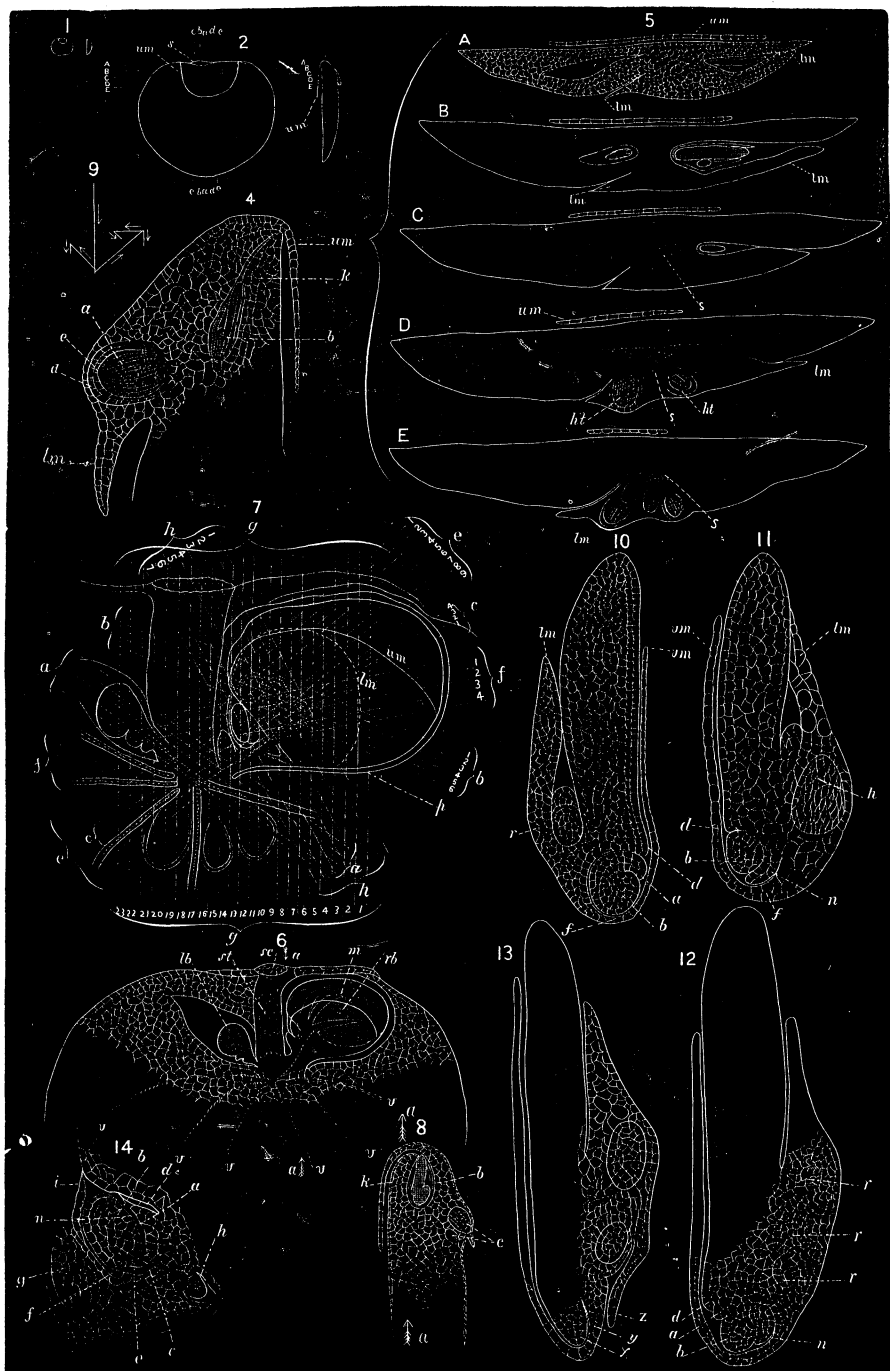
The oval body of Fig. 7 is here seen in the angle between the lower membrane and the body of the bud. It shows itself to be the beginning of a root. The swelling "*d*," Fig. 10, is the section of that projection of the body of the bud over the budlet whose edge shows in Fig. 14 as the double line "*d*." As this projection grows more and more, it shuts over the budlet, reaching down as far as the point "*f*," Fig. 10, and becomes in the frond the lip or cover "*k*," Figs. 4 and 8. The line "*a*," Fig. 14, is shown "*a*," Fig. 10, to be the edge of a ridge starting out from the budlet which as it grows will become the membrane "*um*" of the bud. The section shows us the thickness of the budlet "*b*," and explains that the double row of cells "*f*," Fig. 14, just below the budlet is the optical section of the upper membrane where it bends round to its attachment on the under side of the bud. One cannot help recognizing in the "*um*" of the bud, Fig. 10, the "*um*" of the frond, Fig. 4, which shows itself as the semicircle of Fig. 2.

Turning next to Fig. 11, which also passes through the budlet, but nearer to its stem, and at an angle with the stem of the bud, we find two or three new features. First; we pass through the right hand one of the three oval bodies of Fig. 7, and find it imbedded in the base of the lower membrane, instead of occupying the angle; second, the budlet has a thick horn "*n*" on its under side, and none on its upper. The outline of this membrane is, I think, that indicated by the dotted line, Fig. 14, "*n*," on the budlet, but I have not been able to satisfy myself just where that outline does run. Again, in this section, we see the budlet united with the bud, whereas before, the section, Fig. 10, passed out to the left of the stem and showed that, by lying entirely separate from the bud. Fig. 12, which shows a section nearly parallel with the axis of the budlet, gives a view of both horns "*a*" and "*n*" at once, and showing one root, allows the others *r'* and *r''* to shimmer through the tissue, though out of the focus.

Fig. 13 shows the three roots at once, though with the middle one out of focus. The left hand part of this section is a puzzle to me that I am not sure I have rightly solved. Till I came to it I did not suppose there was any membrane on the lower side like "z." In every other section, out of forty, perhaps, that ran through that neighborhood, there was no projection of the lower membrane toward the left, but the tissue passed continuously from the roots round into the base of the upper membrane, as in Figs. 10, 11, 12. I think there may be a narrow lappet or lobe of the lower membrane at just this part, while below the tissue may be as in the other sections. I do not think that the part marked "x" is part of the budlet, but of the bud.

Now to take one step more: has the budlet the beginning of a budlet of the next generation? Yes, at the point "e," Fig. 14, there is a slight protuberance just about where the upper membrane "a," Fig. 14, comes to the edge of the budlet. And this is what will grow into first the budlet, then the bud, and finally the frond.

When the budlet was dissected out and examined with a $\frac{1}{14}$ (Hartnack's No. 10), the protuberance showed nothing but a group of half a dozen to a dozen cells all alike with no sign of any organ of any sort. This then was the growing point which I set out to find. Now how are the different parts of the frond produced from it? As the first stage we have the budlet: it differs from the growing point only in this that a ridge or lappet has been formed on the upper and under surface, which in the sections shows as two horns as "a" and "n," Fig. 12. These two ridges are really one continuous ridge as I could see when rolling a free budlet over and over. It can be traced from "e," Fig. 14, in a slanting curved line to the back of the budlet near its tip, then down the thickness of the budlet till it joins the ridge of the under side. As our next step, we see in the bud our ridge grown into those two membranes (as we have called them) which a careful examination shows to be still continuous at the back edge of the bud about as far out as the point "p," Fig. 7. Also three roots, Figs. 7, 10, 11, 12, have made their appearance near and in the base of the lower part of the membrane. Also the tissue of the bud is preparing for the five or six veins that the frond is to possess; and the stem possesses a single fibre of spiral cells. Now, lastly, what more do we find in the frond? The edge "d," of Figs. 14 and 10, has grown



ANATOMY OF WINTER BUDS OF LEMNA.

out over the budlet; and, as the section, Fig. 4, shows, forms the cover "k" of the cavity in which the bud "b," Fig. 4, lies. The body of the bud, having grown much faster than the membrane, has left the latter as the semicircle seen at the base in Fig. 2. The same thing is true of the lower membrane which now only forms a border to the enlarged roots.

The books speak of *Lemna* as a plant entirely destitute of leaves, but it seems to me that an exception must be made in the case before us, for this membrane on the upper and under sides

Fig. 54.

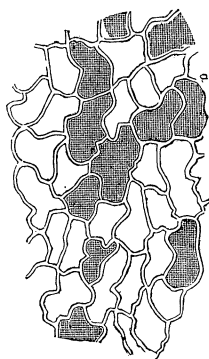


Fig. 55.

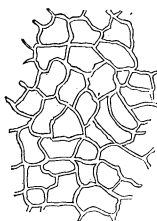
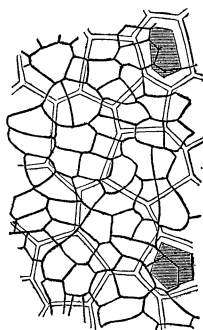


Fig. 56.



seems to answer in its position and formation to the sheathing leaves of the monocotyledons.

I noticed the peculiar form of the cells of the semicircular lobe of the leaf (?) on the upper side of the frond, and made a drawing of them, Fig. 54, and also a drawing of the same organ in the bud state, Fig. 55. It was this peculiar form of cell in the two cases which first led me to think that they were the same thing in different stages of growth. In Fig. 56 I have presented a surface view of the epidermis of the frond, together with the underlying cells of the frond. Two of the latter cells are nearly filled with a large crystal in each. What is the cause of the brown color of some of the cells of the upper lobe of the leaf as shown in Fig. 54, while others are clear, I cannot tell.

EXPLANATION OF PLATE.

Fig. 1. Winter frond, natural size; surface and profile views.

- Fig. 2. Same, enlarged about 10 times. The lines, *a-a*, *b-b*, indicate the direction of the sections of Fig. 53, and those marked A-A, B-B, those of Fig. 5; "*s*" is the scar where the frond was attached to its parent; "*um*" the outline of the upper membrane (drawn with 2 inch objective, 2 inch ocular, distance from camera to paper, 5 inches).
- Fig. 53. In text, longitudinal vertical sections, as marked in Fig. 2 (objective 2 in., ocular 2 in., distance 5 in.).
- Fig. 4. Section in the direction *e-e*, of Fig. 2: "*a*" young root; "*c*" its "summit region;" "*d*" its root-cap; "*b*" young bud; "*k*" lip or cover to the same; "*um*" upper membrane; "*lm*" lower membrane (objective $\frac{3}{8}$ in., ocular 2 in., distance 10 in.).
- Fig. 5. Sections in the directions A-A, B-B, etc., of Fig. 2: "*s*" of C, D, and E, end of stem; "*rt*" roots; "*lm*" and "*um*" same as Fig. 4 (objective $\frac{3}{8}$ in., ocular 2 in., distance 5).
- Fig. 6. Horizontal section in the direction of the arrows *a-a* of Fig. 8: "*rb*" the right hand bud or most developed; "*lb*" left hand bud; "*st*" the stem or axis; "*sc*" scar; "*v*" the veins or ribs of the frond; the arrows "*a-a*" show direction of the section of Fig. 8 (objective $\frac{3}{8}$, ocular 2, distance 5).
- Fig. 7. Outline plan of buds, with lines showing where different sections were made (objective $\frac{3}{8}$, ocular 2, distance 10).
- Fig. 8. Section through *a-a*, of Fig. 6. "*b*" bud; "*c*" roots. "*K*" same as *k*, Fig. 4 (objective $\frac{3}{8}$, ocular 2, distance 5).
- Fig. 9. Diagram of the directions of the axes of growth of the different generations.
- Fig. 10. Vertical section of the bud in the position and direction marked by "*e-e*, 5, Fig. 7," "*r*" root; "*f*" base of "*um*;" "*b*" budlet; "*a*" ridge of budlet, or rudiment of the upper membrane; "*d*" rudiment of lip or cover of bud cavity; "*lm*" and "*um*" as before. The lettering and amplification of Figs. 10, 11, 12 and 14, are the same (objective $\frac{1}{4}$, ocular 2, distance 10).
- Fig. 11. Section through "*g-g*, 12, of Fig. 7," "*n*" the rudiment of lower membrane.
- Fig. 12. Section through "*f-f*, 2 of Fig. 7," "*r-r*" roots below the plane of the rest of the drawing.
- Fig. 13. Section through "*b-b*, 5 of Fig. 7." For "*x y z*" see text.
- Fig. 14. View of the base of the bud of Fig. 6: "*e*" the growing point or budlet of the next generation; "*h*" corresponds with "*b*" of Fig. 6; for "*c*" and "*g*" see text.
- Fig. 51. In text, surface view of portion of upper membrane of frond (objective $\frac{1}{8}$ ocular 2, distance 10).
- Fig. 55. In text, surface view of the upper membrane of the bud (objective $\frac{1}{8}$, ocular 2, distance 10).
- Fig. 56. In text, epidermis of frond with larger cells of the cellular tissue seen underneath, two of the latter containing crystals (objective $\frac{1}{8}$, ocular 2, distance 10).
- All the drawings are camera lucida work except Fig. 1 and a portion of the cells filling up the sectional views.

THE INFLUENCE OF INSECT-AGENCY ON THE DISTRIBUTION OF PLANTS.

BY F. BUCHANAN WHITE, M.D.

IN urging botanists to study the influence that insect agency has upon the distribution of plants (see vol. x., p. 334), Mr. Bennett